

REMARKS:

AMENDMENTS TO THE CLAIMS

Claims **12-36** were examined. Claims **12, 18, 19, and 36** have been amended. New claim **37** is introduced. The Applicant submits that these amendments merely make explicit that which was implicit in the claims as originally filed. Support for the amendments and new claim **37** can be found in the claims as filed and in paragraph [0012] and [0032] of the application as published. As such, no new matter has been entered. Furthermore, the Applicant submits that the amendments are being done to improve readability and do not represent a narrowing of any feature of the claims.

CLAIM REJECTIONS

CLAIM 12 IS ALLOWABLE OVER BRINKER

Claims **12-14, 20-21, 23-25, 27-30, and 34-36** were rejected under 35 USC 102(b) as being anticipated by U.S. Patent 6,264,741 to Brinker et al. (hereinafter “Brinker”). The Applicant respectfully overcomes the rejection.

Amended Claim **12** recites that adjacent layers of the organic polymer and the inorganic material are characterized by direct organic polymer-inorganic material covalent bonds wherein more than one layer of the organic polymer are superhydrophobic layers, and wherein the barrier film has a permeability to water vapor of less than about 0.1 g/m²/day. Certainly, there is no disclosure in Brinker regarding using more than one superhydrophobic layer. Furthermore, Applicant fails to see where Brinker discloses where its film is even suitable for use as a moisture barrier with a permeability to water vapor of less than about 0.1 g/m²/day.

In fact, the Brinker material is quite the opposite. Brinker and his predecessors seek to mimic the mechanical strength and toughness of naturally occurring nacre material (see Brinker Col. 1, lines 35-50). Nacre, however, is not a water barrier. As discussed by the references in the Information Disclosure Statement filed herewith, nacre comes in both wet and dry form. Nacre is easily hydrated after only five hours of soaking in water (Barthelat, “Tensile Testing of Abalone Nacre Miniature Specimens Using Microscopy and Speckle Correlation”, page 2, col. 4, paragraph 2), and the toughness of the material is related to the degree of hydration (Menig et al., Quasi-static and Dynamic Mechanical Response of *Haliotis Rufescens* (Abalone Shells), Acta

Mater. 48 (2000), page 2392, col. 1). It appears to Applicant that a nacre material which hydrates so easily would make for a very poor moisture barrier.

Accordingly, Applicant respectfully submits that there is no motivation to use the Brinker material as a moisture barrier. Applicant's review of the Brinker reference fails to reveal any mention of the words "water barrier", "moisture barrier", "barrier", or similar terminology. In fact, the word "water" is only used with reference to water as a solvent in preparing the film. Its ability to be hydrated teaches against the use of nacre (Brinker synthetic or otherwise) as any type of moisture barrier, particularly one with a permeability to water vapor of less than about 0.1 g/m²/day as recited in the present claim. Based on the foregoing, Brinker fails to show or suggest all elements of amended claim 12, and Applicant respectfully requests that the rejection based on Brinker be withdrawn.

Furthermore, increasing the moisture barrier quality by altering the organic layer of the nanolaminate is also non-obvious. As pointed out by the Office, the traditional technique in the art as noted in the Singh reference is to change the inorganic layer by increasing the amount of silicate in the inorganic material to achieve good barrier properties (see Singh, page 64, lines 25-29). There is no teaching cited by the Office suggesting the modification of the organic layer to improve the moisture barrier qualities. Neither Brinker nor the other cited references rectify this deficiency.

Arguendo, even if Brinker were modified with one of the other cited references, absent the hindsight teachings from the present application, the Office has not provided third party documentation showing a motivation to modify nacre (synthetic or other natural) into a moisture barrier. Nacre and nacre-like materials have been demonstrated to be such poor water barriers that there fails to be a motivation to use such materials as a basis for a water barrier. It seems counterintuitive to create a moisture barrier from a starting material that possesses poor moisture barrier qualities. Additionally, it should also be understood that merely being a hardcoat with improved mechanical strength and toughness does not equate to being a moisture barrier. The Sheldon reference and US Patent 5,731,060 (both newly cited in the IDS) show that the barrier film and hardcoat functions are physically distinct from one another. Accordingly in both cases, the hard coat and barrier film functions are not inherently linked.

In light of the foregoing, Applicant respectfully submits that the rejection based on Brinker has been overcome. Additionally, Applicant also submits that there is no showing or

suggestion to modify Brinker into the presently claimed invention. Although nacre (synthetic or otherwise) may provide a material with improved mechanical strength and toughness, there is no motivation to modify such a water permeable material into a moisture barrier. Applicant respectfully requests that the Office withdraw the rejection based on Brinker and allow claim **12** in the next Office Action.

Dependent claims based off of claim **12** are also allowable as they depend from an allowable base claim. The dependent claims are also novel in their own right. For example, claim **17** recites oxygen permeability of less than about 1 cc/m²/day, 0.1 cc/m²/day, 0.01 cc/m²/day, 10⁻³ cc/m²/day, 10⁻⁴ cc/m²/day, 10⁻⁵ cc/m²/day, or 10⁻⁶ cc/m²/day. As nacre and nacre-like materials are poor water barriers, they would be equally poor oxygen barriers and not have the resistance to permeability as recited in claim **17**.

Furthermore, independent claim **36** is also allowable for substantially the same reasons as set forth for claim **12** as it recites a nanolaminate that is even less permeable than that of claim **12**. New claim **37** is also allowable for substantially the same rationale. Accordingly, both of those claims are also in condition for allowance.

CLAIM 16 IS ALLOWABLE OVER SINGH

Claims **16-17** were rejected under 35 USC 103(a) as being anticipated by U.S. Patent 6,057,035 to Singh et al. in view of PCT Publication WO/0078540 to Singh et al. Applicant fails to see how the teachings of Singh are applicable to alter the moisture permeability of Brinker, which uses a completely different structure than that Singh. Applicant also traverses this rejection as claim **16** and **17** depend from an allowable base claim. Additionally, neither of the Singh references teaches the covalent bond as recited in the base claim of pending claim **12**. Accordingly, claims **16** and **17** are also in condition for allowance.

CLAIM 18 IS ALLOWABLE OVER SINGH AND OGAWA

Claims **18-19** were rejected under 35 USC 103(a) as being unpatentable over U.S. Patent 6,057,035 to Singh et al. in view of U.S. Patent 5,372,888 to Ogawa. Applicant notes that this rejection is moot as it has been previously overcome and withdrawn by the Examiner (see Page 2, item 4 and Page 6 section 11 of the current office action under the Examiner's comments).

Furthermore, Applicant notes that there is no teaching in Ogawa to incorporate a superhydrophobic material as one or more of the sublayers in a multi-layer nanolaminate. Specifically, Ogawa teaches that the protective layer it forms is a monomolecular film (i.e. one molecule thick) formed directly on top of the ornament (see Abstract). It is not part of a nanolaminate. Absent the hindsight teachings of the present application, Applicant fails to see why one would take the monomolecular layer of Ogawa and incur the increased cost of using it in combination with the multi-layer laminate in Singh. Based on the foregoing, a *prima facie* case of obviousness has not been established, and Applicant respectfully submits that the claims **18** and **19** are in condition for allowance.

CONCLUSION

For the reasons set forth above, the Applicant submits that all claims are allowable over the cited art and define an invention suitable for patent protection. The Applicant therefore respectfully requests that the Examiner enter the amendment, reconsider the application, and issue a Notice of Allowance in the next Office Action.

Respectfully submitted,

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